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**Wall, Jr.**

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(54) **VARIABLE LENGTH SHAFT**

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**Related U.S. Application Data**

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(51) **Int. Cl.**

| | |
|---|---|
| ***A63B 53/16*** | (2006.01) |
| ***A63B 53/10*** | (2015.01) |
| ***A63B 53/12*** | (2015.01) |
| ***A63B 53/14*** | (2015.01) |
| *A63B 53/00* | (2015.01) |

(52) **U.S. Cl.**

CPC ..... ***A63B 53/10*** (2013.01); ***A63B 53/12*** (2013.01); ***A63B 53/14*** (2013.01); ***A63B 60/22*** (2015.10); *A63B 60/28* (2015.10); *A63B 2053/005* (2013.01); *Y10T 403/32483* (2015.01)

(58) **Field of Classification Search**

CPC ..... A63B 53/16; A63B 53/10; A63B 53/12; A63B 60/12; A63B 53/14; A63B 2053/005; A63B 60/28; Y10T 403/32483

See application file for complete search history.

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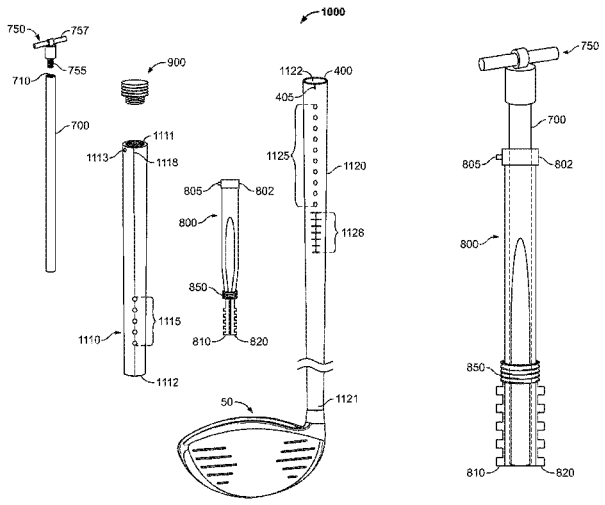
(57) **ABSTRACT**

A variable length golf club shaft is disclosed herein. The variable length shaft includes a hollow lower shaft with a plurality of holes, a hollow upper shaft with at least one protrusion extending from an inner surface that is sized to fit within the plurality of holes, and an unlocking bar. The shaft length can be adjusted by sliding the upper shaft over the lower shaft and using the unlocking bar to release the protrusion from the holes to allow overall shaft length adjustments. in another embodiment, the variable length shaft includes a hollow lower shaft, a hollow upper shaft, an engaging insert, and a locking bar.

**20 Claims, 12 Drawing Sheets**



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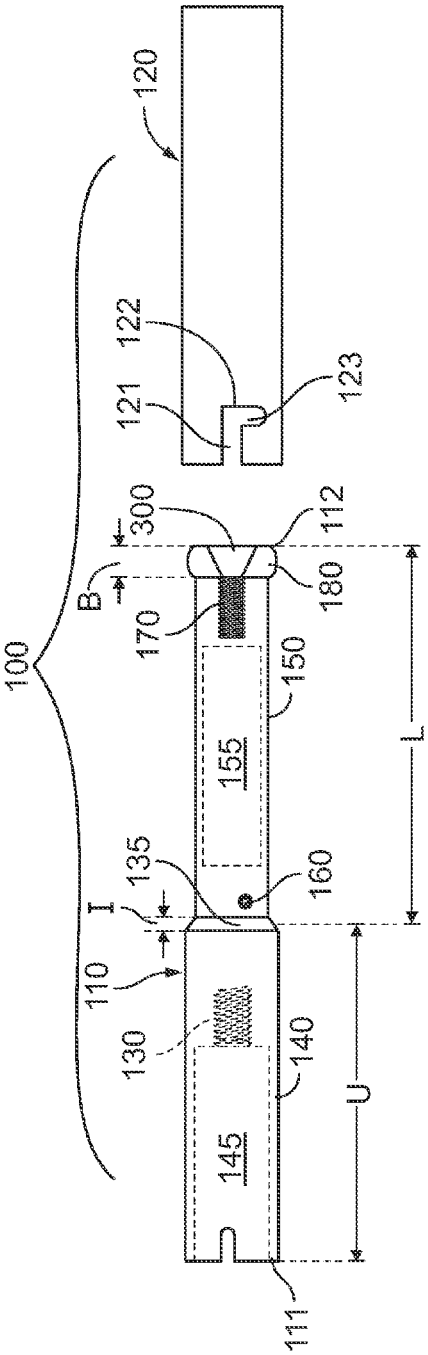
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FIG. 1

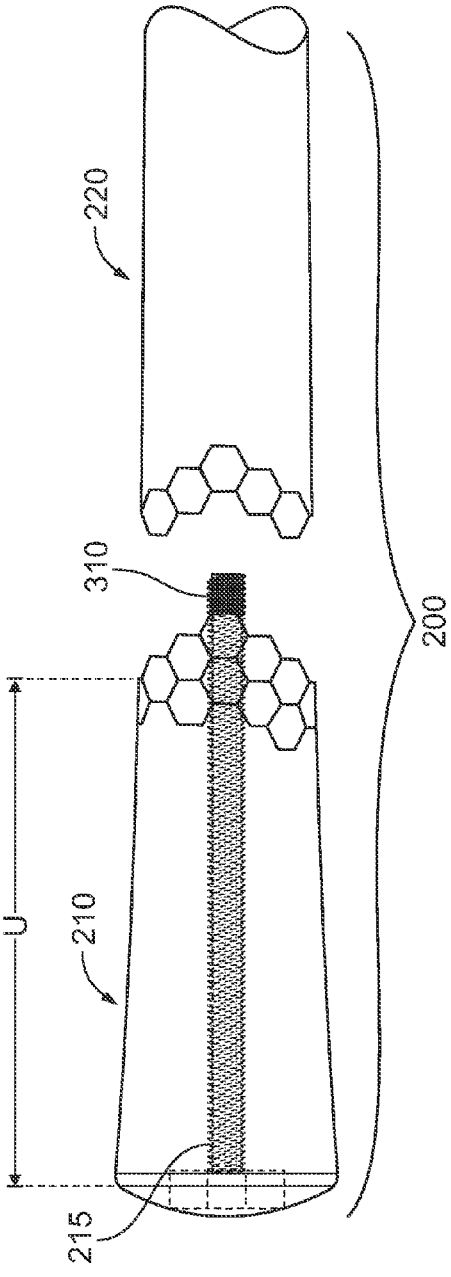
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FIG. 2

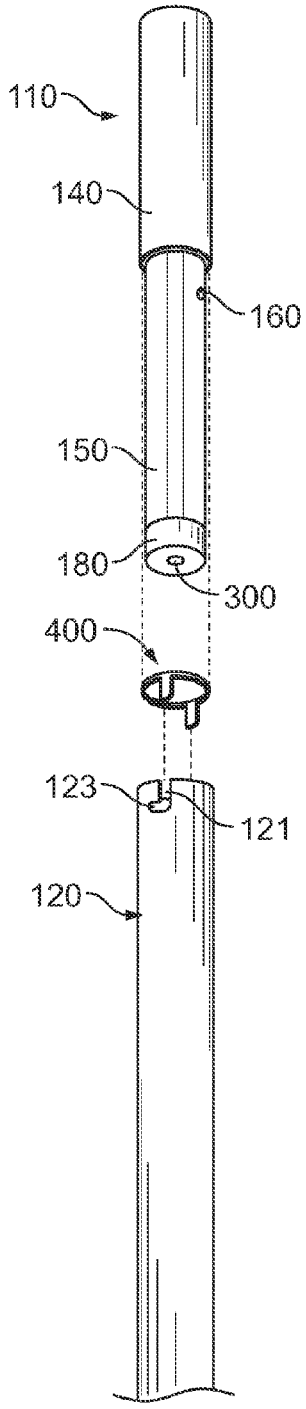


FIG. 3

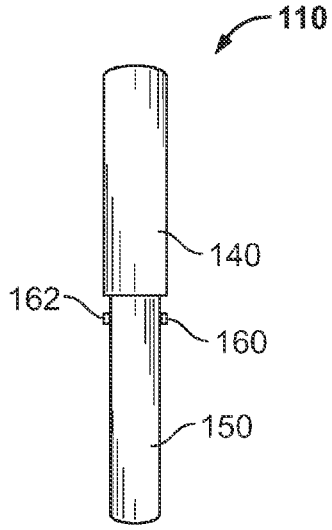


FIG. 4

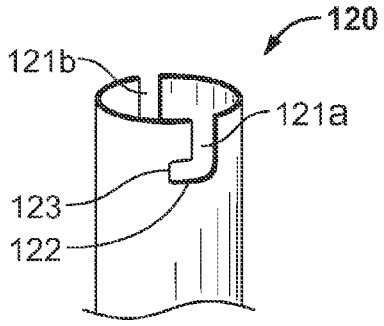


FIG. 5

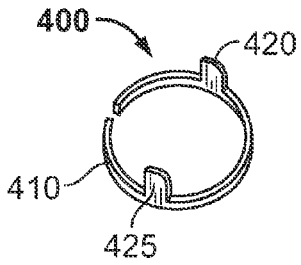


FIG. 6

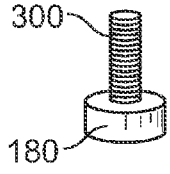


FIG. 7

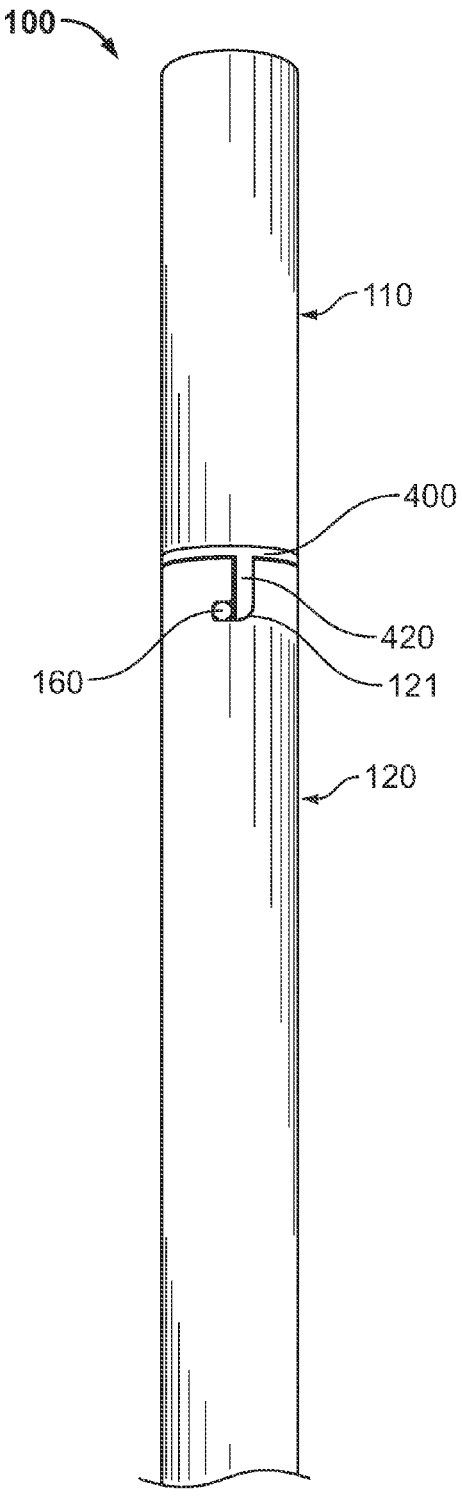


FIG. 8

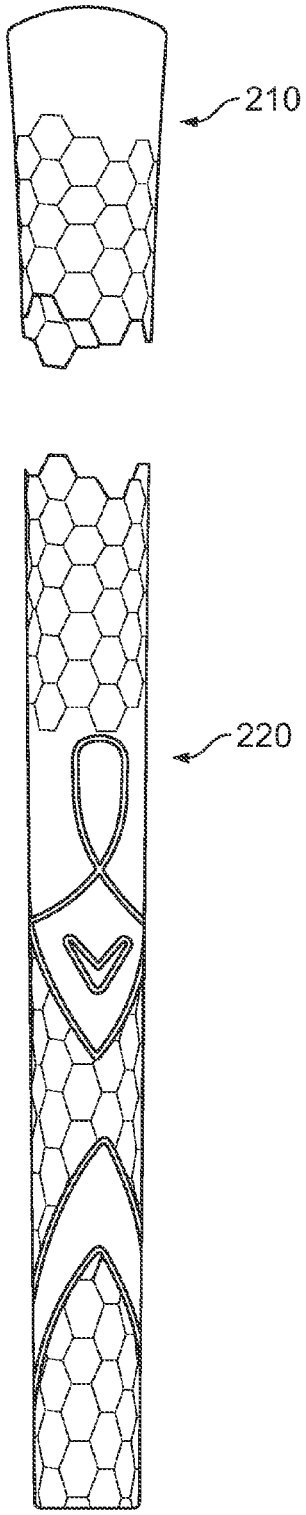


FIG. 9

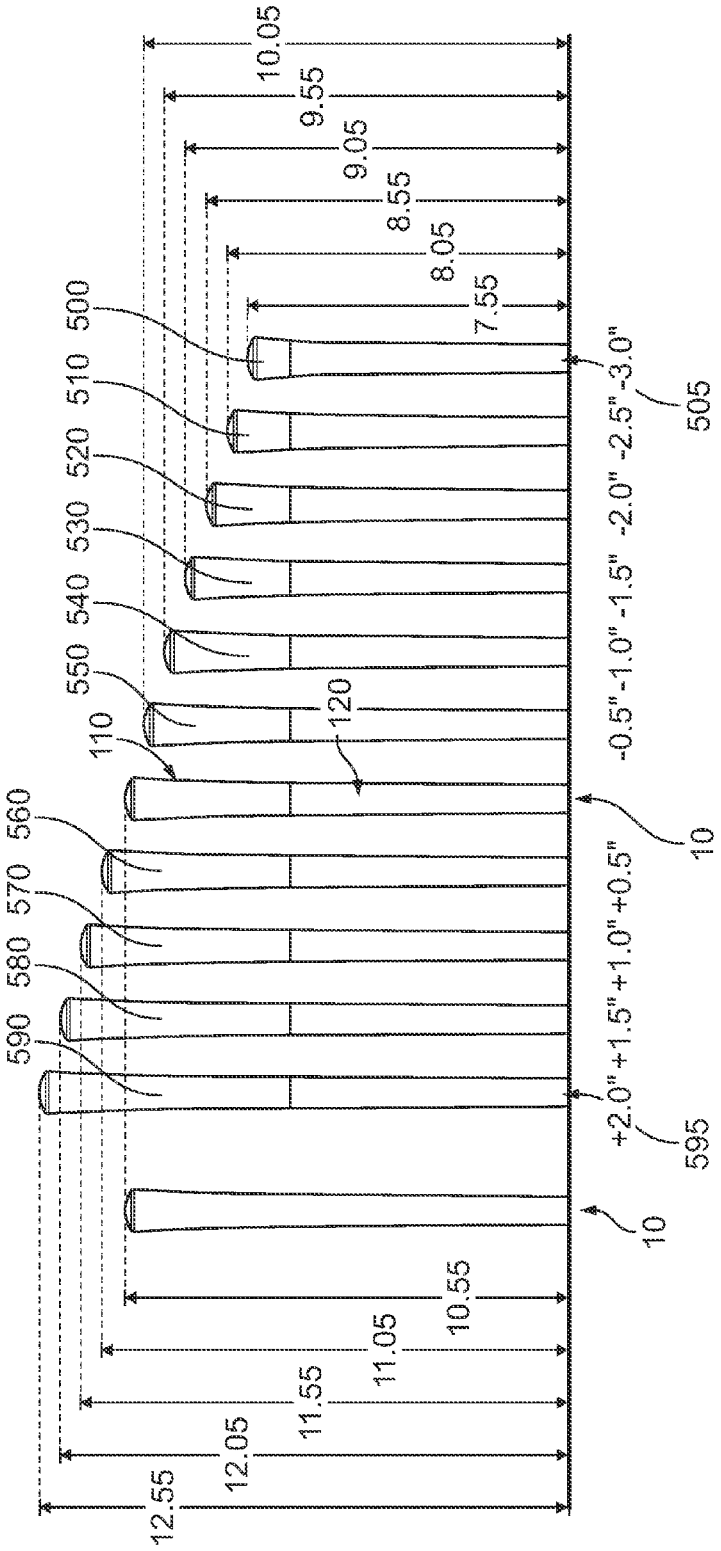
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FIG. 10

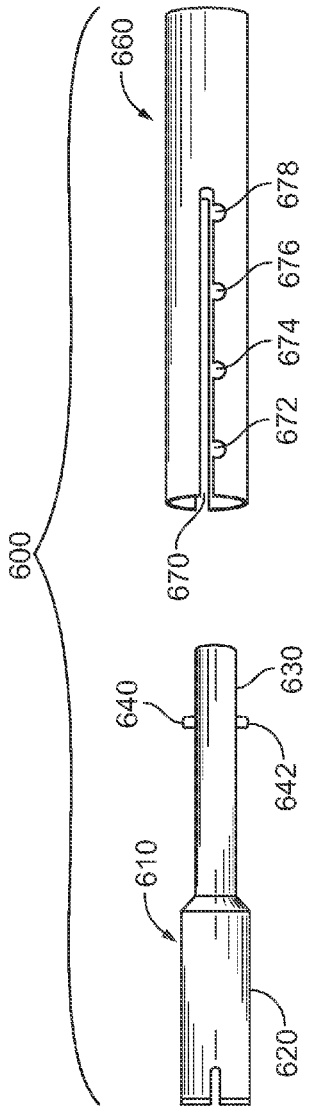


FIG. 11

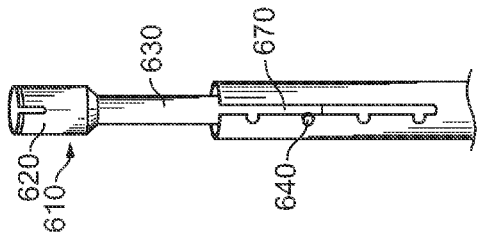


FIG. 12C

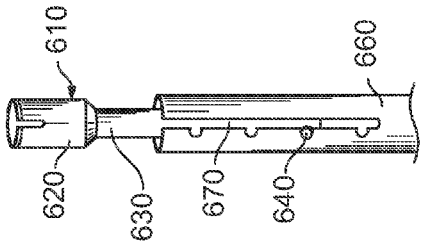


FIG. 12B

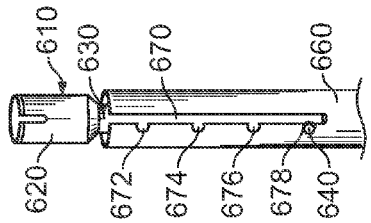


FIG. 12A

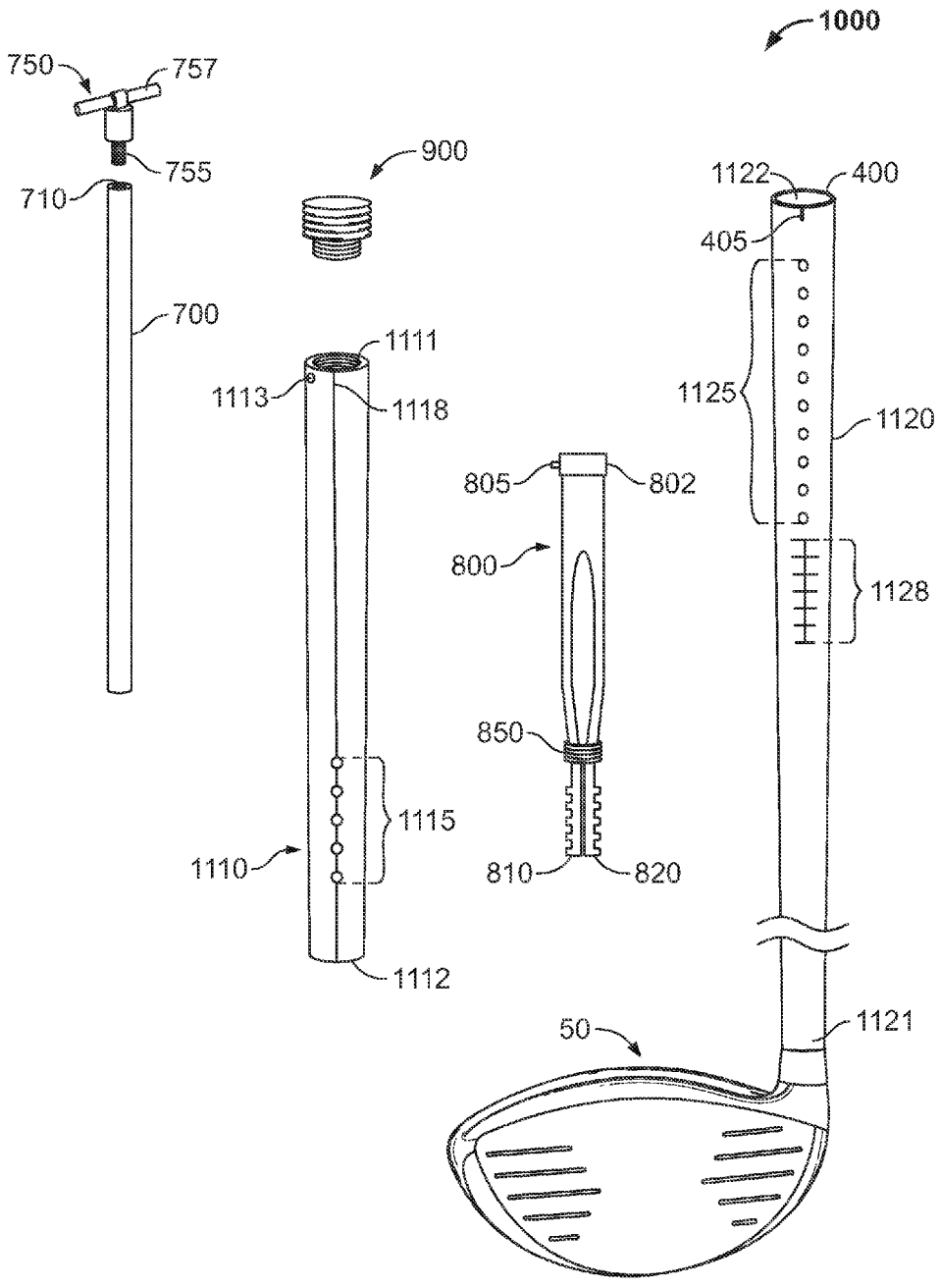
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FIG. 13

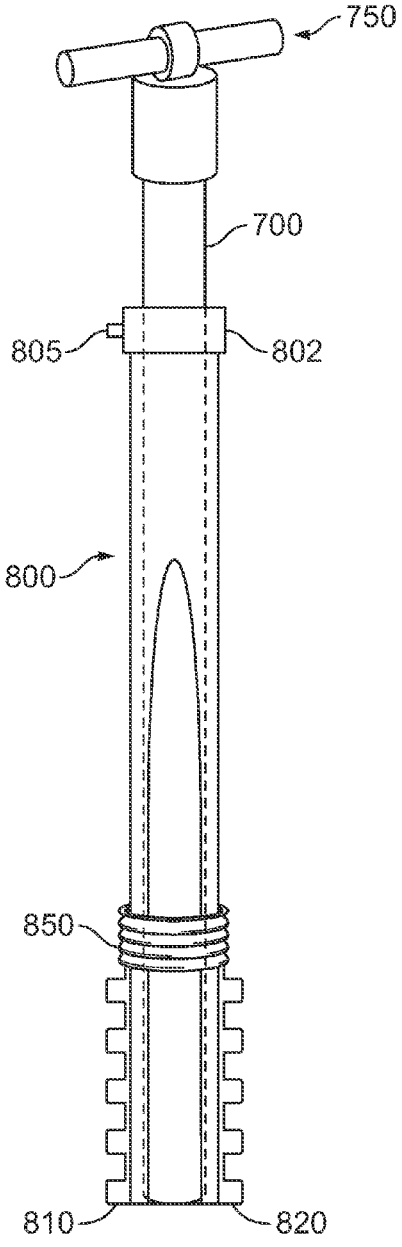


FIG. 14A

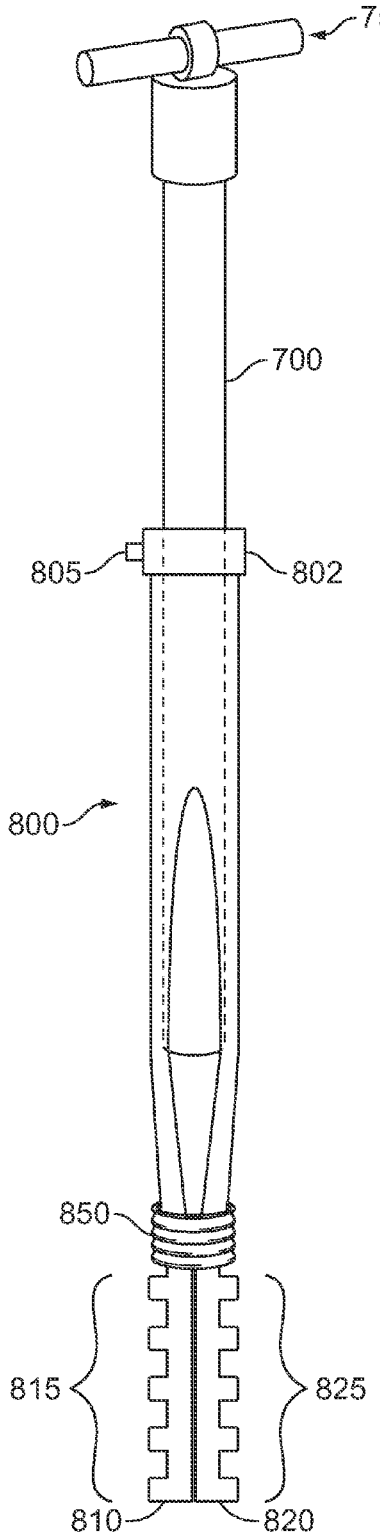


FIG. 14B

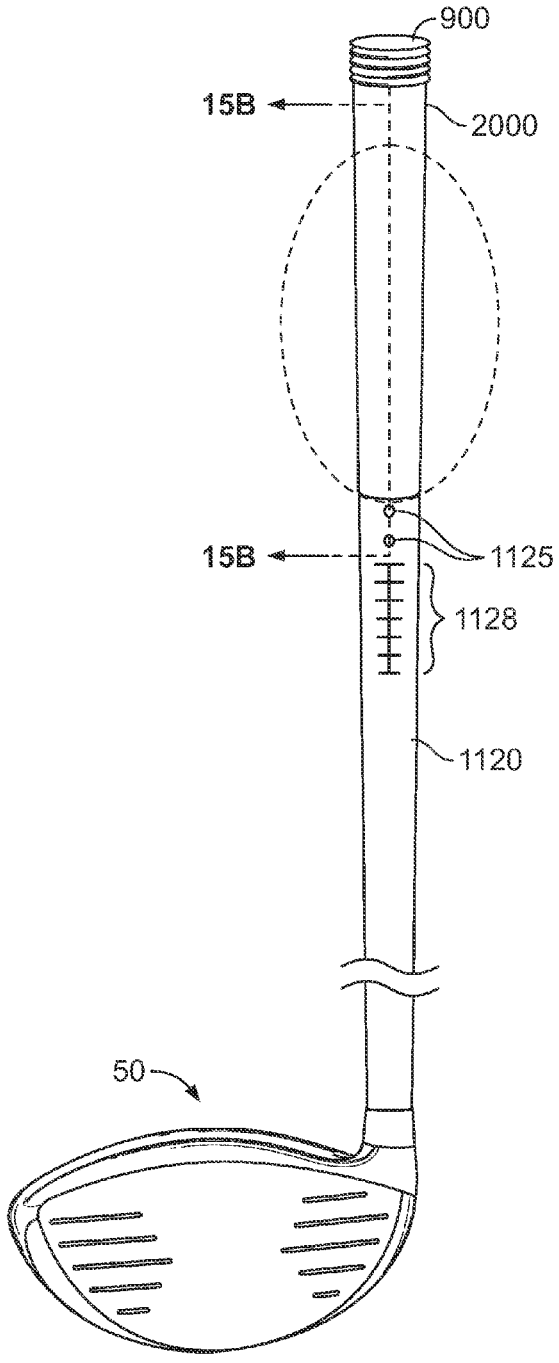


FIG. 15A

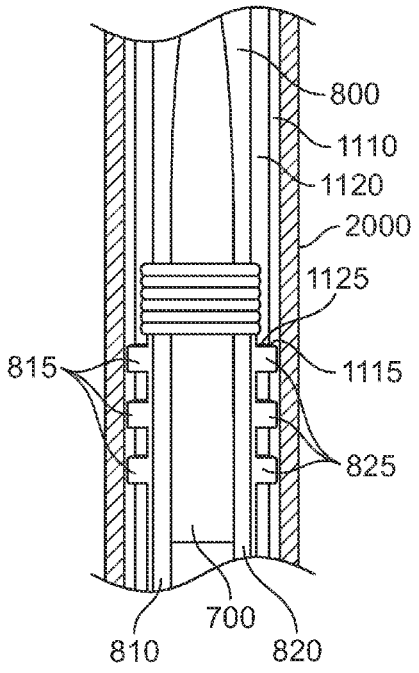


FIG. 15B

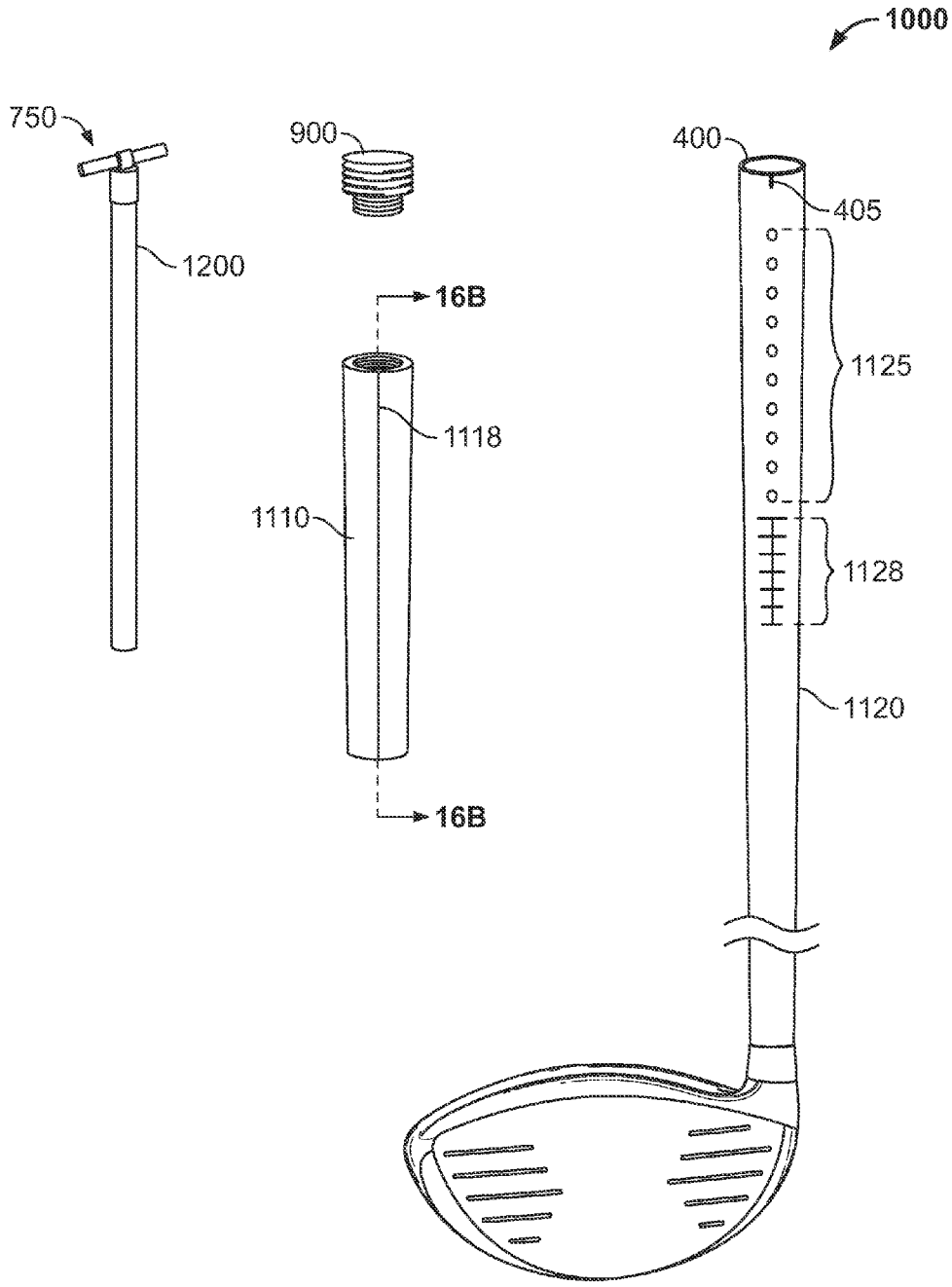


FIG. 16A

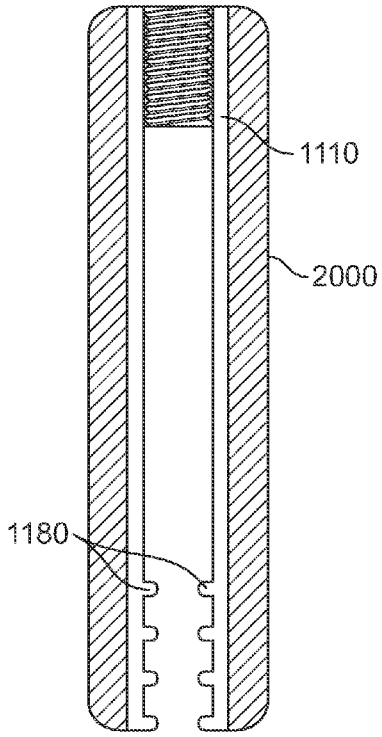


FIG. 16B

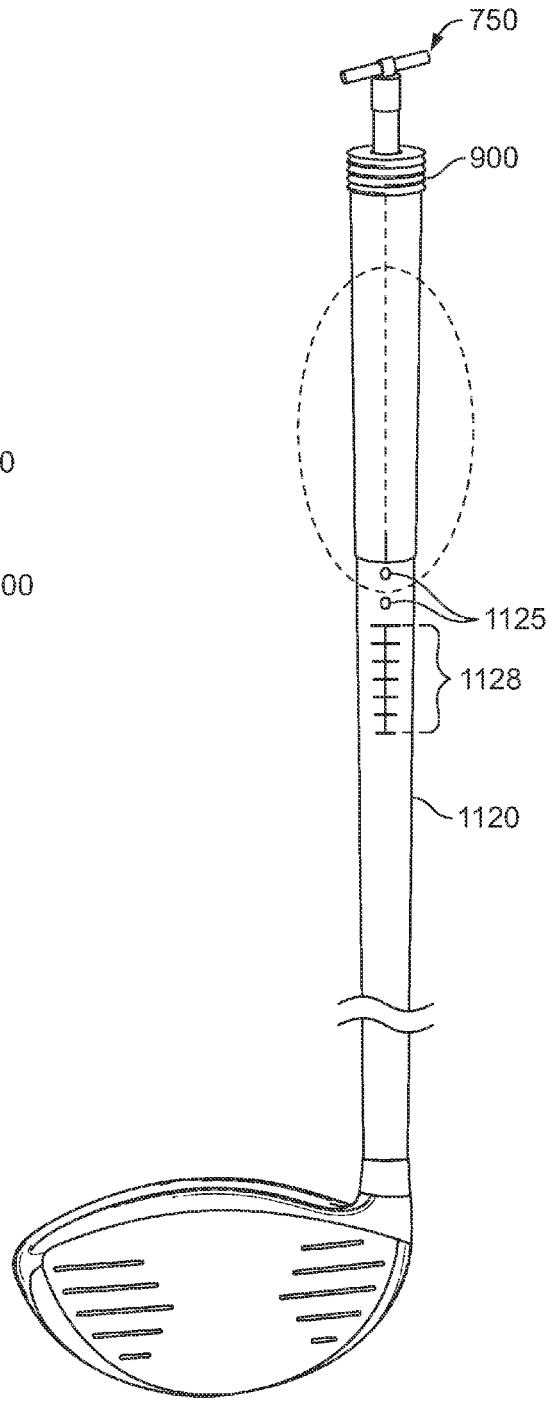


FIG. 17

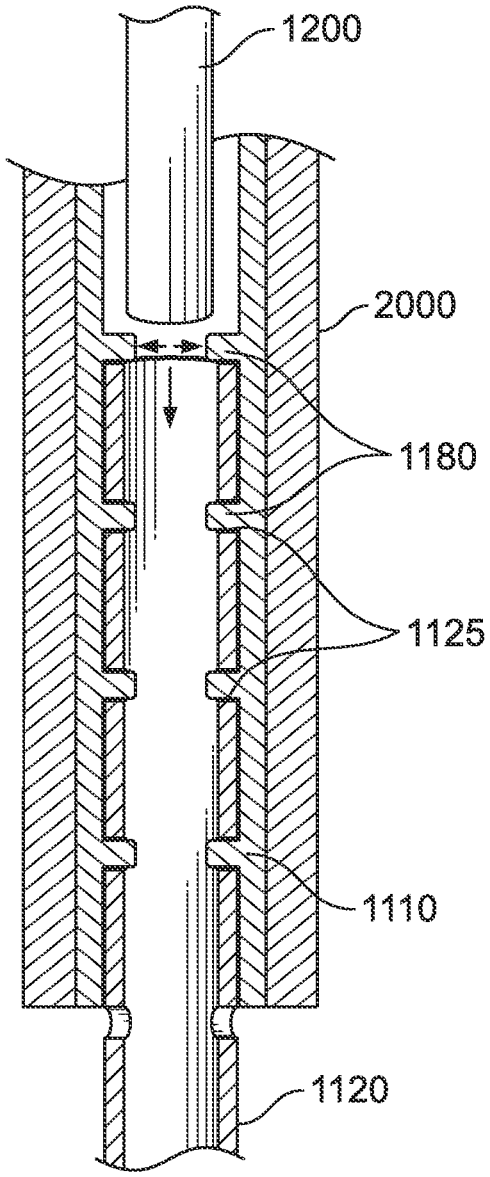


FIG. 18

# VARIABLE LENGTH SHAFT

## CROSS REFERENCES TO RELATED APPLICATIONS

The present application is a divisional of U.S. patent application Ser. No. 13/323,539, filed on Dec. 12, 2011, which is a continuation-in-part of U.S. patent application Ser. No. 13/009,710, filed on Jan. 19, 2011, which issued as U.S. Pat. No. 8,425,345 on Apr. 23, 2013, and which claims priority to U.S. Provisional Patent Application No. 61/422,982, filed on Dec. 14, 2010.

## STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not Applicable

## BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a variable length shaft assembly that allows for quick, semi-permanent length adjustments. More specifically, the present invention relates to a variable length shaft whose length can be adjusted in a short period of time with the use of a simple tool and without the use of many different components.

2. Description of the Related Art

Customization of golf clubs to help golfers attain better shots has become a popular and more prevalent practice in recent years. Golf club manufacturers and designers have devised various features to allow club fitters and golf club players to adjust certain characteristics of their clubs. Such characteristics include loft, lie, face angle, center of gravity (CG) location, and club length.

Current technology provides two methods to adjust overall club length. One such method involves damage to or destruction and removal of the grip on a shaft. Upon removal of the grip by tearing or peeling, the end portion of the shaft can be trimmed or otherwise cut to decrease the club length, or an extension piece can be affixed to the end of the shaft to increase its length. Aftermarket extensions are available specifically for this purpose; alternatively, extensions can be made from portions of other golf club shafts that are cut to the desired length and then inserted into the end of the first club's shaft. The extension piece must match the diameter of the existing shaft, so it is necessary at times to build up the diameter of the extension or existing shaft by adding layers of tape. This method requires that the user making the adjustments have access to potentially expensive new components and tools as well as having a high level of skill. It also causes damage to the shaft and the grip.

The second method of adjusting club length involves replacing the entire shaft and grip using a semi-permanent head-shaft connection device that some manufacturers offer with their clubs, particularly with drivers. The existing shaft may be removed from the driver head and replaced with a different shaft that has either a shorter or longer length. This method is not possible on all clubs, however, as the head must have hardware that allows for removal of the shaft and replacement with a new shaft without damaging the head.

A golfer who does not possess club altering skills or the necessary disposable income to purchase new components likely will be daunted by these two methods of adjusting club length. The first method requires the golfer to make use of several tools to remove the grip and cut the shaft if he or she desires a shorter length, and also to have materials such as tape and a replacement grip on hand. The skill set required to change the shaft length using this method is usually beyond the abilities of the average golfer, so the golfer would need to seek the services of a golf club fitter or technician to have their club length changed. The second method requires the golfer to buy an entirety new shaft at a different length, which can be very expensive, and also may require the golfer to retain a golf club fitter or technician to replace the shaft.

Ultimately, the two methods described above require an inventory of spare components and above average technical skill, particularly with regard to the first method. It is therefore desirable to facilitate the change of a club's length using a faster, easier, and less expensive method than is currently available.



## BRIEF SUMMARY OF THE INVENTION

One aspect of the present invention is a variable length golf club shaft comprising a hollow upper shaft comprising a wall having a plurality of holes, a hollow lower shaft comprising a wall having a plurality of holes, a hollow engaging insert comprising an expanding portion having at least one protrusion sized to fit within one or more of the plurality of holes on each of the upper shaft and lower shaft, a grip, and a locking bar, wherein the engaging insert is disposed within the upper shaft, wherein the upper shaft is sized to slidably receive the lower shaft, wherein a portion of the lower shaft is disposed between a portion of the upper shaft and a portion of the engaging insert, and wherein inserting the locking bar into the engaging insert causes the expanding portion to expand, the at least one protrusion to engage with at least one of the plurality of the holes on each of the upper shaft and the lower shaft, and the portion of the lower shaft to press against the portion of the upper shaft.

In a further embodiment, each of the upper shaft and the lower shaft may comprise a longitudinal axis, and the plurality of holes on each of the upper shaft and the lower shaft may be arranged along the longitudinal axes of the upper shaft and the lower shaft. The plurality of holes on the lower shaft may comprise at least ten holes each on at least two opposing sides of the lower shaft all, and the plurality of holes on the upper shaft may comprise at least three holes each on at least two opposing sides of the upper shall all. The engaging insert may further comprise two prongs, wherein each of the prongs comprises at least one protrusion, and wherein the prongs are pulled toward each other by an expandable band, and inserting the locking bar into the engaging insert may stretch the expandable band and push the prongs away from each other.

In another further embodiment, each of the upper shaft, lower shaft, engaging insert, and locking bar is composed of a composite material, and the grip is affixed to an external surface of the upper shaft. The variable length golf club shaft may further comprise a weighted cap, wherein the upper shaft comprises an opening at an upper end and an opening at a lower end, wherein the opening at the lower end receives the lower shaft, and wherein the opening at the upper end receives the weighted cap. Sliding the upper shaft along the lower shaft may adjust an overall length of the variable length golf club shaft over a range of 3 inches. In a further embodiment, the upper shaft may comprise a slit along a longitudinal axis to accommodate along the lower shaft, and the lower shaft may comprise a locating clip that mates with the slit and prevents the upper shaft from twisting when it slides along the lower shaft.

Another aspect of the present invention is a variable length golf club shaft comprising a hollow lower shaft comprising a wall having a plurality of holes, a hollow upper shaft comprising an exterior surface and an interior surface, wherein the interior surface comprises at least one protrusion sized to fit within at least one of the plurality of holes, and wherein the upper shaft is sized to slidably receive the lower shaft and an unlocking bar sized to fit within the upper shaft and the lower shaft, wherein sliding the upper shaft over the lower shaft causes the protrusion to engage with at least one of the plurality of holes, wherein engagement of the protrusion with one or more of the plurality of holes fixes the upper shaft to the lower shaft, and wherein inserting the unlocking bar into the upper shaft and the lower shaft when the upper shaft is fixed to the lower shaft disengages the protrusion from the one or more plurality of holes and permits the upper shaft to move along a length of the lower shaft.

In a further embodiment, the plurality of holes may comprise at least ten holes each on at least two opposing sides of the lower shaft wall, and the interior surface of the upper shaft may comprise at least three protrusions each on at least two opposing sides of the interior surface. The plurality of holes may be arranged along a longitudinal axis of the lower shaft, and the protrusions may be arranged along the longitudinal axis of the upper shaft, and sliding the upper shaft along the lower shaft may adjust an overall length of the variable length golf club shaft over a range of 3 inches. The upper shaft and lower shaft may each be composed of a composite material, and a grip may be affixed to the exterior surface of the upper shaft. The variable length golf club shaft may further comprise a weighted cap received by an opening at the upper end of the upper shaft.

Yet another aspect of the present invention is variable length golf club shaft comprising a hollow upper shaft composed of a composite material, the upper shaft comprising an exterior surface, an interior surface, a longitudinal axis, a plurality of protrusions arranged along the longitudinal axis on opposing sides of the interior surface, a slit extending along the longitudinal axis, an open upper end, and an open lower end, a hollow lower shaft composed of a composite material and sized to fit within the upper shaft, the lower shaft comprising a wall, a plurality of through holes arranged along a longitudinal axis on opposing sides of the wall, an open upper end, and a lower end for engagement with a golf club head, a locating clip disposed at the open upper end of the lower shaft, the locating clip comprising a protruding edge that mates with the slit, a grip affixed to the exterior surface of the upper shaft, the grip comprising an open upper end, a cap sized to fit within the open upper end of the grip and the open upper end of the upper shaft, and an unlocking bar sized to fit within the lower shaft and the upper shaft, wherein inserting the lower shaft into the upper shaft so that the protrusions interact with the plurality of through holes fixes the upper shaft to the lower shaft, and wherein inserting the unlocking bar into the upper shaft and the lower shaft when the upper shaft is fixed to the lower shaft pushes the protrusions out of the plurality of through holes and permits the upper shaft to move along a length of the lower shaft.

In a further embodiment, the cap may comprise external threads, the open upper end of the upper shaft may comprise internal threads sized to receive the external threads, and the cap may be weighted to adjust the overall weight of the variable length golf club shaft. The grip may also be composed of a rubber material, and the locating clip may be composed of a lightweight metal material.

Having briefly described the present invention, the above and further objects, features and advantages thereof will be recognized by those skilled in the pertinent art from the following detailed description of the invention when taken in conjunction with the accompanying drawings.

## BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. **1** is a side plan view of an unassembled first embodiment of the variable length shaft of the present invention.

FIG. **2** is a side plan view of a grip to be used with the variable length shaft shown in FIG. **1**

FIG. **3** is a side plan view of the variable length shaft shown in FIG. **1**

FIG. **4** is a side plan view of an upper shaft portion of the embodiment shown in FIG. **3**.

FIG. **5** is an enlarged, side perspective view of part of the lower shaft portion of the embodiment shown in FIG. **3**.

FIG. **6** is a side perspective view of the locating clip shown in FIG. **3**.

FIG. **7** is a side perspective view of the expandable bushing shown in FIG. **3**.

FIG. **8** is a side plan view of the embodiment shown in FIG. **3** in assembled form.

FIG. **9** is a side perspective view of the grip shown in FIG. **2**.

FIG. **10** is a side view of different lengths of upper shaft sections of the variable length shaft of the present invention.

FIG. **11** is a side plan view of an unassembled second embodiment of the present Invention.

FIGS. **12**A, **12**B, **12**C are side plan views of different assemblies of the embodiment shown in FIG. **11**.

FIG. **13** is an unassembled, side plan view of the parts of a third embodiment of the present invention.

FIGS. **14**A and **14**B are side plan views of the locking bar interacting with the engaging insert of the embodiment shown in FIG. **13**.

FIG. **15**A is an assembled, side plan view of the embodiment shown in FIG. **13**.

FIG. **15**B is a cross-sectional view of the circled part of the embodiment shown in FIG. **15**A along lines **15**B-**15**B.

FIG. **16**A is an unassembled, side plan view of the elements of a fourth embodiment of the present invention.

FIG. **16**B is a cross-sectional view of the upper shaft piece shown in FIG. **16**A along lines **16**B-**16**B

FIG. **17** is a side plan view of the assembled embodiment shown in FIG. **16**A.

FIG. **18** is a cross-sectional view of the circled part of the embodiment shown in FIG. **17**, showing the unlocking bar engaging the upper and lower shaft pieces.

## DETAILED DESCRIPTION OF THE INVENTION

The present invention is directed to a variable length shaft and grip that provides club length adjustability. Club length adjustability is an advantageous feature for golf clubs, because, for example, extending the length of a club can have the desired effect of increasing club head speed, which results in longer driving distances. Conversely, shortening the length of a club would provide a golfer with more control and accuracy in driving the golf ball. Golf course conditions often require accurate driving due to hazards, including but not limited to water, rough, sand, and out of bounds markers,

and driving accuracy can be more preferred than driving distance in competitive situations.

The present invention is also valuable because a golfer's swing may change over time, thus requiring alterations to his or her clubs. A golfer may improve his or her game through lessons and may gain greater flexibility and strength through practice and exercise. As such, it is reasonable for a golfer to wish to change his or her club's length to help improve accuracy, distance, and feel as needed or desired.

The present invention provides golfers with a system and method to easily, quickly and inexpensively modify the length of their golf clubs to have them perform in a desired manner. This invention will enable golfers to change their club length wherever they wish, including, but not limited to, at the practice range, the golf course, and their home. The present invention also is designed to avoid altering a club's swing weight or its "feel." The components used to alter a club's length in the present invention are small and can be carried in a pocket of the user's golf bag. Furthermore, the technical ability required to modify the golf club length according to this invention is minimal and its approach is intuitive and easy for a golfer to understand.

FIGS. **1-9** show a first embodiment of the present invention. This embodiment comprises a two-part shaft **100** having upper **110** and lower **120** sections, a two-part grip **200** having upper **210** and lower **220** sections, and a locating clip **400** to secure the upper shaft section **110** to the lower shaft section **120**. In this embodiment, a user can remove the upper shaft and grip sections **110**, **210** from the lower shaft and grip section **120**, **220** and replace them with upper shaft and grip sections **110**, **210** having different overall lengths and/or weights.

As shown in FIGS. **1**, **3**, and **4**, the upper shaft **110**, which has proximal **111** and distal ends **112** and proximal and distal portions **140**, **150**, includes a threaded hole **130** located in the proximal portion **140**. As shown in FIG. **1**, the threaded hole **130** extends from a hollow interior portion **145** located in the proximal portion **140** of the upper shaft **110** toward the distal portion **150**. In an alternative embodiment, the threaded hole **130** may extend from the furthest extent of the proximal end **111** toward the distal portion **150**. One or more weights (not shown) may optionally be placed in the hollow interior **145** of the proximal portion **140** to affect swing balance.

As shown in FIG. **1**, the proximal portion **140** of the upper shaft **110** has a length "U." In the preferred embodiment, a user can separate the upper shaft **110** from the lower shaft **120** and replace the upper shaft **110** with another upper shaft piece having a different "U" length. In this way, a user can change the overall length of the shaft **100** without changing the lower shaft **120**, i.e, without having to handle a golf club head (not shown). The proximal and distal portions **140**, **150** of the upper shaft **110** are separated by an intermediate portion **135**, which, in the preferred embodiment, has a length "I" of approximately 0.125 inches, The length I remains the same across varying lengths of upper shaft pieces in the preferred embodiment, but in an alternative embodiment this length I may vary depending on the upper shaft **110** selected.

As shown in FIGS. **1**, **3**, and **4**, the distal portion **150** of the upper shaft **110** includes at least one protruding pin **160**, which has a diameter of 0.080 inches, and also comprises a hollow interior portion **155**, which can optionally hold weights (not shown) or be left empty to reduce the overall weight of the shaft **100**. In the preferred embodiment, the upper shaft **110** has two protruding pins **160**, **162**, shown in FIG. **4**, each of which has a diameter of approximately 0.080 inches. In the preferred embodiment, the distal portion **150** has a length "L" of approximately 2.250 inches, but in other embodiments this length may vary depending on the upper shaft **110** selected by the user.

As shown in FIG. **1**, in the preferred embodiment the distal portion **150** further includes a threaded bore **170** originating at the distal end **112** of the upper shaft **110**, and an expandable bushing **180** having a through hole is affixed to the distal end **112** with a bolt **300**. See also FIGS. **3** and **7**. The expandable bushing **180** may, in alternative embodiments, be affixed to the distal end **112** using adhesives or other methods. The expandable bushing **180** preferably is composed of a polymer, particularly 65 Shore D urethane, and has a length "B" of approximately 0.250 inches. In other embodiments, the expandable bushing **180** is composed of neoprene or plastic. The expandable bushing **180** helps to secure, via friction, the upper shaft **110** to the lower shaft **120** when the upper and lower shaft pieces **110**, **120** are assembled as disclosed herein.

As shown in FIGS. **1**, **3**, and **5**, the lower shaft **120** comprises at least one notch **121**. In the embodiment shown in FIG. **5**, the lower shaft **120** comprises two notches **121***a*, **121***b*, to receive the two pins **160**, **162**. The lower shaft **120** is hollow and has a diameter that is greater than the diameter of the distal portion **150** of the upper shaft **110**. To assemble the upper shaft **110** with the lower shaft **120**, the distal portion **150** of the upper shaft **110** is inserted into the hollow interior of the lower shaft **120** and is oriented such that the pins **160**, **162** slide into the notches **121***a*, **121***b*. Once the pins **160**, **162** come into contact with the ends **122**, (not shown) the notches **121***a*, **121***b*, the upper shaft **110** is twisted such that the pins **160**, **162** are engaged by side channels **123**, (not shown) of the notches **121***a*, **121***b*.

Once the upper and lower shaft pieces **110**, **120** are assembled as described above, the locating clip **400**, shown in FIGS. **3** and **6**, is applied to secure the pieces. The locating clip **400** comprises a circular piece of material **410**, preferably metal, and more preferably titanium alloy, which has at least one prong **420** extending perpendicularly away from the circular material **410**. In the preferred embodiment, the locating clip has two prongs **420**, **425**. The locating clip **400** is slid over the proximal end **111** of the upper shaft piece **110**, and the prongs **420**, **425** are fitted into the notches **121***a*, **121***b* to prevent the pins **160**, **162** from moving out of the side channels **123**, (not shown) and back into the notches **121***a*, **121***b*. FIG. **8** shows the upper and tower shaft pieces **110**, **120** in fully assembled form with the locating clip **400** in place.

The grip pieces **210**, **220** of the present invention are shown in FIGS. **2** and **9**. As shown in FIG. **2**, the upper grip **210** includes a hole **215** that spans the length "U" of the upper grip **210** and receives a bolt **310**. The upper grip **210** is installed on the upper shaft **110** by sliding the upper grip **210** over the upper shaft **110** so that the upper grip **210** encircles at least the upper portion **140**, inserting the bolt **310** into the upper grip hole **215** and engaging the bolt **310** with the threads of the upper shaft hole **130**. Tightening the bolt **310** removably secures the upper grip **210** to the upper shaft **110** and holds the locating clip **400** in place. When the bolt **310** is removed, the upper grip section **210** can be removed from the upper shaft section **110**. The lower grip **220** is installed on the lower shaft **120** using double sided tape or another type of adhesive. Alternatively, in another embodiment, the upper grip **210** is affixed to the upper shaft portion **110** with double sided tape or adhesive.

FIG. **10** shows that the lengths of the lower shaft sections **120** are not altered in the embodiments of the present

invention. In other words, a golfer would not exchange the lower shaft piece **120** for a lower shaft piece **120** of a different length. The lower shaft piece **120** of the present invention thus can be permanently affixed to a desired golf club head (not shown). In contrast, according to the first embodiment of the present invention and as disclosed in FIG. **10**, the upper shaft section **110** of a normal length club **10** can be easily swapped for other upper shaft sections **500**, **510**, **520**, **530**, **540**, **550**, **560**, **570**, **580**, **590**, having different overall lengths. The upper shall sections **500-590** can also have different weights to allow the golfer to change the overall club weight as desired.

FIG. **10** discloses an assortment of upper shaft sections, each having different lengths so that the total club length of the first and second embodiments can range from a short, 43-inch club **505** to along, 48-inch club **595**. These upper shaft sections can be sold to golfers in kit format along with a lower shaft section **120**. As such, if a golfer wishes to increase the length of a shaft, he or she may remove the upper shaft section **110** and replace it with an upper shaft section having a greater length **560**, **570**, **580**, **590**. In contrast, if the golfer wishes to decrease the length of the shaft, he or she may remove the upper shaft section **110** and replace it with an upper shaft section having a shorter length **500**, **510**, **520**, **530**, **540**, **550**. The embodiments of this invention thus allow the golfer to increase or decrease the length of a golf club shaft without detaching the lower shaft section **210** from the club head or cutting or damaging any part of the shaft.

A second embodiment of the present invention, which does not require multiple upper shaft or grip pieces having varying lengths, is shown in FIGS. **11** and **12**A-**12**C. A variable length shaft **600** has an upper shaft piece **610** and a lower shaft piece **660**. The upper shaft piece is similar in structure to the upper shaft piece **110** shown in FIG. **1**, as it has an upper portion **620**, a lower portion **630**, and one or more pins **640**, **642** located on the lower portion **630**. The lower shaft piece **660** has at least one notch **670** sized to hold the one or more pins **640**, **642**. In this embodiment, the at least one notch **670** has more than one side channel **672**, **674**, **676**, **678**, within which the pins **640**, **642** can fit.

To assemble this embodiment, the lower portion **630** of upper shaft piece **610** is inserted in the hollow interior of the lower shaft piece **660** such. that the pins **640**, **642** slide into the at least one notch **670**. When the combination of the lower and upper shaft pieces **610**, **660** equals a desired overall shaft length, the upper shaft piece **610** is twisted so that the one or more pins **640**, **642** slide into the selected side channel **672**, **674**, **676**, **678**, as shown in FIGS. **12**A, **12**B, and **12**C. If a user wishes to change the overall length of the shaft **600**, the upper shaft piece **610** is twisted again so that the one or more pins **640**, **642** leave the selected side channel **672**, **674**, **676**, **678**. A locating clip (not shown) may be used to prevent the pins **640**, **642** from leaving the selected side channel **672**, **674**, **676**, **678**. Once the user achieves the desired overall shaft **600** length and locks the pins **640**, **642** within the selected side channel **672**, **674**, **676**, **678**, a grip is sized and fitted to the shaft **600**.

A third embodiment of the present invention, which also does not require multiple upper shaft or grip pieces having varying lengths, is shown in FIGS. **13**, **14**A, **14**B, **15**A, and **15**B. A variable length shaft **1000** has an upper shaft piece **1110** and a lower shaft piece **1120**, each of which is hollow. The upper shaft piece **1110** has an open upper end **1111**, an open lower end **1112**, and a plurality of holes **1115** that extend through the wall of the upper shaft piece **1110**, preferably on at least two, opposite sides of the upper shaft piece **1110** proximate the open lower end **1112**. The external surface of the upper shaft piece also has a grip **2000** affixed to it, preferably by an adhesive.

The lower shall piece **1120** also has an open upper end **1122**, a lower end **1121** that can be engaged with a golf club head **50**, and a plurality of holes **1125** that extend through the wall of the lower shaft piece **1120**, preferably on at least two, opposite sides of the lower shaft piece **1120**, proximate the open upper end **1122** of the lower shaft piece **1120**. The lower shaft piece **1120** has a diameter that is slightly smaller than the innermost diameter of the upper shaft piece **1110** so that the lower shaft piece **1120** can be snugly inserted into the upper shaft piece **1110**.

As shown in FIG. **13**, the plurality of holes **1115**, **1125** on both the upper and lower shaft pieces **1110**, **1120** are arranged along a longitudinal axis of the shaft pieces **1110**, **1120**, and can be aligned when the lower shaft piece **1120** is inserted into the open lower end **1112** of the upper shaft piece **1110**. By sliding the upper shaft piece **1110** over the lower shaft piece **1120**, different holes from the plurality of holes **1125** on the lower shaft piece **1120** line up with the plurality of holes **1115** of the upper shaft piece **1110**, and different overall lengths of the variable length shaft **1000** can be achieved based a the holes **1125** selected. The lower shaft piece **1120** preferably includes length markings **1128** on its exterior surface, proximate to or below the plurality of holes **1125**, so that a user can determine how far to slide the upper shaft piece **1110** along the lower shaft piece **1120** in either direction. The lower shaft piece **1120** also preferably includes a locating clip **400** with a protruding edge **405** disposed at its open upper end **1122**. The protruding edge **405**, which preferably is 0.040 inch wide and 0.030 inch long, engages a longitudinal slit **1118** through the side of the upper shaft piece **1110** and prevents the upper shaft piece **1110** from twisting as it is slid up or down along the lower shaft piece **1120**.

The embodiment shown in FIGS. **13**-**14**B also comprises a hollow engaging insert **800** that is used to fix the upper shaft piece **1110** to the lower shaft piece **1120** when the variable length shaft **1000** has a desired overall length. The engaging insert **800**, shown in more detail in FIGS. **14**-A and **14**B, is preferably fixed within the upper shaft piece **1110** so that the pieces can be used as a unit. The engaging insert **800** may be affixed to the upper shaft piece **1110** by adhesive, or more preferably by a locking pin **805** protruding from an upper shelf portion **802** of the engaging insert **800**. In this configuration, the upper shelf portion **802** rests against the open upper end **1111** of the upper shaft piece **1110**, while the locking pin **805** engages a locking hole **1113** located proximate the open upper end **1111** of the upper shaft piece **1110**. This configuration makes it difficult, but not impossible, for a user to disengage the engaging insert **800** from the upper shaft piece **1110**. The locking pin **805** may be retained within the upper shelf portion **802** by any means, including a clip, which is preferably made of urethane.

When the variable length shaft **1000** is assembled as described herein and shown in the Figures, and a user has selected a desired overall length by sliding the upper shaft piece **1110** over the tower shaft piece **1120**, the user can semi-permanently fix the shaft pieces **1110**, **1120** together by threading a locking bar **700** through the engaging insert **800**, causing the engaging insert, **800** to expand and to press the lower shaft piece **1120** against the upper shaft piece **1110**, as shown in FIGS. **14**A and **14**B. In a preferred version of this embodiment, the engaging insert **800** comprises two prongs **810**, **820**, which are spaced from each other when the locking bar **700** is inserted into the engaging insert **800** and

are pressed against each other when the locking bar **700** is removed. The prongs **810**, **801** are held together by an elastic connector **850**, which may be a rubber or urethane band. The locking bar **700** stretches the elastic connector **850** and pushes the prongs **810**, **820** apart when engaged with the engaging insert **800**.

The locking bar **700** can be inserted into and removed from the engaging insert **800** by any means, but is preferably inserted or removed using a tool **750**. In the embodiment shown in FIGS. **13**, **14**A, and **14**B, the locking bar **700** is a hollow tube having internal threads proximate an upper opening **710**. The tool **750** has matching external threads **755** that mate with the internal threads to connect the tool **750** to the locking bar **700**. The tool also has a handle **757** that allows a user to push the locking bar **700** into or pull the locking bar **700** out of the engaging insert **800**. The threads may be reversed in an alternative embodiment.

As shown in FIG. **13**, and in more detail in FIGS. **14**A and **14**B, the prongs **810**, **820** of the engaging insert **800** preferably each comprise a plurality of protrusions **815**, **825** facing away from each other. As shown in FIG. **15**A, and in greater detail in FIG. **15**B, when this embodiment of the variable length shaft **1000** is fully assembled and a length is selected by lining up a chosen plurality of holes **1125** on the lower shaft piece **1120** with the plurality of holes **1115** on the upper shaft piece **1110**, the upper shaft piece **1110** is semi-permanently attached to the lower shaft piece **1120** by inserting the locking bar **700** into the engaging insert **800**, thereby pushing the prongs **810**, **820** apart and forcing the protrusions **815**, **825** into the plurality of holes **1125** on the lower shaft piece **1120** and the plurality of holes **1115** on the upper shaft piece **1110**, all of which are proximate the protrusions **815**, **825**.

The tool **750** is then removed from the locking bar **700**, which is left inside the engaging insert **800** to semi-permanently fix the upper shaft piece **1110** to the lower shaft piece **1120** at the desired overall length. If a user wishes to adjust the overall length of the variable length shaft **1000**, the tool **750** can be used to remove the locking bar **700** so that the upper shaft piece **1110** can be slid along the lower shaft piece **1120** again.

Once the variable length shaft **1000** of this embodiment is assembled, the open upper end **1111** of the upper shaft portion **1110** can be closed off with a cap **900**, which may be weighted to adjust the overall weight of the variable length shaft **1000**. The cap **900**, which preferably is approximately 0.40 inch long, may be affixed to the open upper end **1111** by any means, but is preferably affixed with mating threads, which may be disposed on interior or exterior surfaces of both the cap **900** and the upper shaft portion **1110**.

A fourth, preferred embodiment of the present invention, which also does not require multiple upper shaft or grip pieces having varying lengths, is shown in FIGS. **16**A, **16**B, **17**, and **18**. This embodiment is even lighter in weight than the third embodiment because it does not include an engaging insert **800**, nor does it include a locking bar **700** that is retained within the shaft **1000** to semi-permanently fix the upper shaft piece **1110** to the lower shaft piece **1120**.

As shown in FIGS. **16**A and **16**B, the preferred embodiment of the variable length shaft **1000** includes the same lower shaft piece **1120** as the third embodiment, including the plurality of holes **1125** and length markings **1128**, and an upper shaft piece **1110** having protrusions **1180** extending from at least two sides of its internal surface. The upper shaft piece **1110** may also include a longitudinal slit **1118** to accommodate its sliding over the exterior surface of the lower shaft piece **1120**. As in the third embodiment, a protruding edge **405** of a locating clip **400** disposed on the lower shaft piece **1120** can engage the longitudinal slit **1118** to guide the movement of the upper shaft piece **1110** and prevent it from twisting.

The upper shaft piece **1110** is sized to snugly grip the lower shaft piece **1120**, and the protrusions **1180** on the interior surface of the upper shaft piece **1110** engage the plurality of holes **1125** on the lower shaft piece **1120** upon encountering them. As shown in FIGS. **16**A and **18**, an unlocking bar **1200** is used to disengage the protrusions **1180** from the plurality of holes **1125** and allow the upper shaft piece **1110** to slide along the length of the lower shaft piece. The unlocking bar **1200** has a diameter that is large enough to push the protrusions **1180** out of the holes **1125** and permit the upper shaft piece **1110** to slide along the lower shaft piece, **1120**, but small enough to fit within both the upper shaft piece **1110** and the lower shaft piece **1120**. The unlocking bar **1200** may have ridges or small protrusions (not shown) on its own exterior surface to further assist in pushing the protrusions **1180** out of the holes **1125**. The unlocking bar **1200** preferably pushes the protrusions **1180** out of the holes **1125** far enough to permit the upper shaft piece **1110** to slide along the lower shaft piece **1120**, but the protrusions **1180** preferably engage the holes **1125** briefly during sliding long enough to create a clicking or ratcheting sound, which indicates to the user where the holes **1125** are, and thus the locations which the upper shaft **1110** can be fixed along the lower shaft **1120**.

The pieces of the variable length shaft and grip of the various embodiments of the present invention may be composed of one or more of any number of materials, including metals, plastics, rubbers, urethanes, and composites, and may have any number of dimensions so long as they are sized to achieve the functions described herein. The shaft portions **110**, **120** **610**, **660**, **1110**, **1120**, locking bar **700**, engaging insert **800**, locating clip **400**, and the bolts **300**, **310** may be composed of titanium, graphite or carbon composite, plastic, magnesium, aluminum, steel, or alloys of such materials, specifically stainless steel 17-7 or titanium 6-4, The shaft portions **110**, **120** **610**, **660**, **1110**, **1120**, locking bar **700**, unlocking bar **1200**, and engaging insert **800** preferably are composed of graphite. The grip portions **210**, **220** preferably are composed of rubber material and the expandable bushing **180** and elastic connector **850** are preferably composed of urethane. The cap **900** preferably is composed of both metal and plastic materials, and the bolts **300**, **300**, and the locating clip **400** preferably are composed of a metal material. The pieces of the variable length shaft and grip disclosed herein may also be bonded together with an adhesive to prevent unwanted separation and ensure adequate strength during club use. The variable length shaft and grip disclosed herein may be used with any type of golf club head, including irons, woods, and putters.

From the foregoing it is believed that those skilled in the pertinent art will recognize the meritorious advancement of this invention and will readily understand that while the present invention has been described in association with a preferred embodiment thereof, and other embodiments illustrated in the accompanying drawings, numerous changes, modifications and substitutions of equivalents may be made therein without departing from the spirit and scope of this invention which is intended to be unlimited by the foregoing except as may appear in the following appended claims. Therefore, the embodiments of the invention in which an exclusive property or privilege is claimed are defined in the following appended claims.

I claim:

1. A variable length shaft comprising:

a hollow upper shaft comprising a wall having a plurality of holes;

a hollow lower shaft comprising a wall having a plurality of holes;

a hollow engaging insert comprising an expanding portion having at least one protrusion sized to fit within one or more of the plurality of holes on each of the upper shaft and lower shaft;

a grip; and

a locking bar,

wherein the engaging insert is disposed within the upper shaft,

wherein the upper shaft is sized to slidably receive the lower shaft,

wherein a portion of the lower shaft is disposed between a portion of the upper shaft and a portion of the engaging insert, and

wherein inserting the locking bar into the engaging insert causes the expanding portion to expand, the at least one protrusion to engage with at least one of the plurality of the holes on each of the upper shaft and the lower shaft, and the portion of the tower shaft to press against the portion of the upper shaft.

2. The variable length shaft of claim 1, wherein each of the upper shaft and the lower shaft comprises a longitudinal axis, and the plurality of holes on each of the upper shaft and the lower shaft are arranged along the longitudinal axes of the upper shaft and the lower shaft.

3. The variable length shaft of claim 1, wherein the plurality of holes on the lower shaft comprises at least ten holes each on at least two opposing sides of the lower shaft wall, and wherein the plurality of holes on the upper shaft comprises at least three holes each on at least two opposing sides of the upper shaft wall.

4. The variable length shaft of claim 1, wherein the engaging insert comprises two prongs, wherein each of the prongs comprises at least one protrusion, and wherein the prongs are pulled toward each other by an expandable band.

5. The variable length shaft of claim 4, wherein inserting the locking bar into the engaging insert stretches the expandable band and pushes the prongs away from each other.

6. The variable length shaft of claim 4, wherein the expandable hand is composed of a material selected from rubber and urethane.

7. The variable length shaft of claim 1, wherein each of the upper shaft, lower shaft, engaging insert, and locking bar is composed of a composite material.

8. The variable length shaft of claim 1, wherein the grip is affixed to an external surface of the upper shaft.

9. The variable length shaft of claim 1, further comprising a weighted cap, wherein the upper shaft comprises an opening at an upper end and an opening at a lower end, wherein the opening at the lower end receives the lower shaft, and wherein the opening at the upper end receives the weighted cap.

10. The variable length shaft of claim 1, wherein sliding the upper shaft along the tower shaft adjusts an overall length of the variable length shaft, and wherein the variable length shaft allows for overall length adjustment in the range of 3 inches.

11. The variable length shaft of claim 1, wherein the upper shaft comprises a slit along a longitudinal axis to accommodate sliding along the lower shaft, and wherein the lower shaft comprises a locating clip that mates with the slit and prevents the upper shaft from twisting when it slides along the lower shaft.

12. The variable length shaft of claim 1, wherein the lower shaft piece comprises an exterior surface having at least one length marking.

13. The variable length shaft of claim 1, wherein the engaging insert is fixed within the upper shaft with an adhesive.

14. The variable length shaft of claim 1, wherein the engaging insert comprises a locking and wherein the locking pin fixes the engaging insert within the upper shaft.

15. The variable length shaft of claim 14, wherein the locking pin protrudes from an upper shelf portion of the engaging insert.

16. The variable length shaft of claim 15, wherein the upper shelf portion rests against an open upper end of the upper shaft, and wherein the locking pin engages a locking hole located proximate the open upper end.

17. The variable length shaft of claim 1, wherein the locking bar is a hollow tube.

18. The variable length shaft of claim 17, wherein the locking bar comprises an upper opening and internal threads located proximate the upper opening.

19. The variable length shaft of claim 18, further comprising a tool, wherein the tool comprises external threads sized to mate with the internal threads, and wherein the external threads removably connect the tool to the locking bar.

20. The variable length shaft of claim 19, wherein the tool comprises a handle.

* * * * *